6-1-2002

Canola Production

Kathleen Grady
South Dakota State University

COOPERATIVE EXTENSION SERVICE
SDSU

Extension Extra

ExEx 8130
Updated June 2002
Plant Science

COLLEGE OF AGRICULTURE & BIOLOGICAL SCIENCES / SOUTH DAKOTA STATE UNIVERSITY / USDA

Canola Production

Kathleen Grady, oilseed breeder and extension specialist,
SDSU Plant Science Department

Canola is an edible form of rapeseed developed by Canadian plant breeders in the 1970s. Rapeseed and canola are members of the mustard family, which also includes tame and wild mustard, cabbage, cauliflower, kale, and turnip.

The term "canola" was registered in 1979 by the Western Canadian Oilseed Crushers Association as the name for rapeseed varieties with genetically modified oil composition and lowered glucosinolates. Canola varieties must have less than 2% erucic acid in the processed oil and less than 30 micromoles of glucosinolates per gram of oil-free meal. The lowered levels of these two seed components enable the oil to be used for human consumption and the meal to be fed to livestock.

Canola seed contains about 40% oil and 23% protein. The oil is high in mono- and polyunsaturated fatty acids (oleic, linoleic, and linolenic). The meal contains about 36 to 40% protein after oil extraction and is highly palatable.

In contrast, rapeseed oil contains 40% or more erucic acid and is used primarily as an industrial lubricant. The high erucic acid content makes rapeseed oil a poor-quality vegetable oil for human consumption. Rapeseed meal contains glucosinolates that lead to palatability and nutritional problems when formulated into animal feeds.

China, Canada, and Europe are the major world producers of canola/rapeseed. U.S. canola production has risen from 199,000 acres in 1993 to over 1.1 million acres in 1998. North Dakota and Minnesota lead the U.S. in canola production.

Adaptation

Both winter and spring types of annual canola are available. However, winter canola is less winterhardy than winter cereals and generally will not survive in South Dakota.

Spring-sown canola belongs to one of two species, *Brassica napus* (commonly called the Argentine type) or *Brassica rapa* (known as the Polish type). Polish varieties mature 10 days to 3 weeks earlier and are more resistant to shattering than Argentine types. Argentine varieties have a higher yield potential under good growing conditions.

Canola is a cool-season crop sensitive to hot, dry weather. High temperatures and/or drought during flowering or pod formation will decrease the number of pods and seeds per pod, resulting in lower yields. Canola production should be limited to areas where heat and drought stress do not persist during flowering and seed set. Spring canola is best adapted to northeastern South Dakota, although it has been successfully grown in north-central and northwest South Dakota in recent years.

Field Selection and Rotation

Medium-textured soils are most suitable for canola production. Adequate drainage is essential, as canola does not tolerate waterlogged or flooded conditions. Sandy soils, however, usually lack sufficient water-holding capacity to support a canola crop through periods of drought.

Canola should not be grown on the same field more often than once in 4 years to prevent buildup of diseases, insects, and weeds. Rotation with sunflower, dry beans, soybean, mustard, lentils, and other crops susceptible to Scierotinia diseases (white mold) should also be avoided within a 4-year period. Canola should generally follow small grains or fallow in the rotation.

It is important to select fields relatively free of broadleaved weeds, especially wild mustard, for canola production. There are few herbicides registered in the U.S. for use on canola. Wild mustard is a serious contaminant of harvested canola seed and is nearly impossible to control in the crop.

Canola is sensitive to carryover residues from several herbicides. Avoid fields that may have carryover herbicide residues injurious to canola or that have significant volunteer growth from previous crops that may compete with canola growth.

Canola shatters easily, and volunteer plants can be expected the next season. Follow canola with a crop such as cereals that allows for the use of broadleaf herbicides to control volunteers.

Planting

A firm, moist, well-packed seedbed is essential for canola stand establishment. Fall tillage followed by a shallow cultivation in early spring or immediately before planting will kill weeds and prepare the seedbed. Avoid excessive or deep tillage in the spring, as this dries out the soil.

Canola can be grown under reduced or minimum tillage systems, but particular attention must be paid to residue distribution, weed control, seed placement, and fertility. Weed control is likely the most important factor affecting the success of notill canola.

Soil crusting can severely reduce canola stands. Harrowing is not recommended on canola due to excessive crop injury.

Canola is a very small-seeded crop, and shallow seeding is essential for good seedling emergence. Seeding depth should be no deeper than 1/2 to 1 inch.

Canola can be successfully seeded with most grain drills, as long as the drill is properly calibrated to accurately meter the seed, place it at a uniformly shallow depth into sufficient moisture, and adequately pack the soil around the seed. Narrow row spacings of 7 inches or less have been shown to give the highest yields, although wider spacings (up to 14 inches) also can be used successfully.

Seeding Rates and Dates

Canola will yield well over a fairly wide range of seeding rates and plant populations. Seeding rates of 5 to 8 lb/A for Argentine (*B. napus*) varieties and 4 to 7 lb/A for Polish (*B. rapa*) varieties are recommended. The goal is to establish a plant population between 7 and 17 plants/ft^2. Canadian research suggests that only 60-80% of planted canola produces viable plants. The higher recommended seeding rates will help assure at least minimum plant populations under less than ideal seeding conditions.

Canola seed varies considerably in size, especially between species and between hybrids and open-pollinated types. *B. napus* (Argentine) and hybrid varieties usually have larger seeds than *B. rapa* (Polish) and open-pollinated varieties. Seeding rates should be adjusted accordingly.

Optimum planting date for canola is late April to early May for highest yield and oil content. Soil temperature should be at least 50 F for fast germination and emergence. Seeding of Argentine varieties after May 15 may result in significant yield reductions. Argentine canola requires about 1040 growing degree-days to mature properly, similar to spring wheat. About 850 growing degree-days are required by Polish canola, similar to barley. The base temperature for calculation of growing degree-days for canola is 41 F (5 C).

Fertilization

Soil testing is the best way to determine nutrient requirements for any crop. Recommended fertilizer rates for canola are similar to small grains. Canola requires about 6.5 lb of nitrogen for each 100 lb of yield.

Canola is very sensitive to nitrogen fertilizer placed with the seed. Nitrogen plus K_2O applications in direct contact with the seed should not exceed 10 lb/A when planted in 6- or 7 inch rows. Urea-based fertilizers, DAP (18-46-0), and ammonium thiosulfate (21-0-0-26) should not be placed with the seed.

Canola requires more phosphorus than wheat for good yields. Canola usually will respond to phosphorus fertilizer on soils testing low for phosphorus. About 50 lb/A of fertilizer phosphate is recommended for a canola yield goal of 2000 lb/A on soils testing low for phosphorus. On most soils, banding phosphate fertilizer near the seed is most efficient. Canadian research has shown that a starter or pop-up response is often obtained with 10-15 lb/A of phosphate banded near the seed, even on soils testing high in available phosphorus.

Canola yield response to applied potassium has not been as consistent as response to nitrogen or phosphorus when the soil is deficient in these nutrients. It generally does not pay to use potassium fertilizer on soils that do not test low for potassium. However, on soils where potassium is very low, a marked yield increase may occur in response to potassium fertilizer. For a canola yield goal of 2000 lb/A, 70 lb/A of potassium fertilizer is recommended for a soil testing low in available potassium.

Canola has a rather high sulfur requirement, and fields even marginally deficient in sulfur can have severely reduced yields. Sulfur deficiencies are not common on South Dakota soils, but may sometimes occur on sandy soils with low organic matter content. If you suspect that your soil may be sulfur-deficient, have a soil test conducted.

For more information on canola fertility, see SDSU CES EC 750, Fertilizer Recommendations Guide, or NDSU Circular SF-718, Fertilizing Mustard, Rapeseed, Canola and Crambe.

Varieties

Table 1 provides information on spring-sown canola varieties tested in recent South Dakota trials.

Variety selection should be based on variety characteristics such as yield, oil content, maturity, herbicide tolerance, disease resistance, and tendency to shatter. Evaluate as much performance information as possible when selecting a variety, looking at relative performance over many locations and years. In some cases, characteristics such as maturity or disease resistance may offset a yield advantage.

Weed Control

Weeds can severely limit canola production, particularly if the weeds emerge ahead of the crop. Canola is a poor weed competitor in its early growth stages. Once established, however, canola competes well with most weeds. Cultural practices (seedbed preparation, seeding date and rate, depth of seeding, etc.) that ensure establishment of a vigorous, healthy canola crop will aid greatly in weed control.

Trifluralin, Poast , and Assure II are the only herbicides currently labeled for use on regular (non-herbicide-tolerant) canola in South Dakota. Roundup Ultra and RT may be used to burn down emerged weeds at planting, particularly for no-till canola.

Because herbicide options are limited, it is important to evaluate the weed history of a field before planting it to canola. Many weeds are best controlled in previous crops in the rotation. Avoid fields where previous annual weed pressure was heavy or that may have significant volunteer growth from previous crops. Pay special attention to the control of wild mustard before planting (or avoid planting canola in fields where wild mustard occurs).

Canola varieties are now available with tolerance to glufosinate (Liberty), glyphosate (Roundup), imidazolonone (Raptor), or triazine (atrazine or Bladex) herbicide. Roundup Ultra is labeled for use on Roundup Ready canola. However, no glufosinate, imidazolonone, or triazine products are currently registered for use on canola in South Dakota. Use of these chemicals would require a Section 18 emergency exemption.

Canola is sensitive to herbicide carryover and to drift from most broadleaf herbicides. Observe recommended planting intervals.

For specific information on herbicide rates, weed and crop response, and timing of application, refer to the product label or SDSU Cooperative Extension Service factsheet 525-OS, Weed Control in Oilseed Crops.

Diseases

Several diseases can cause serious losses in canola production. Blackleg and Sclerotinia stem rot are the two most serious disease problems in South Dakota, North Dakota, and Minnesota. Other minor diseases that may also occur include Alternaria black spot, root rot or damping off (sometimes called wirestem and caused primarily by Rhizoctonia solani), and aster yellows.

Sclerotinia stem rot (white mold) affects many broadleaved crops including canola, mustard, sunflower, dry beans, soybean, field peas, alfalfa, and lentils. The long-lived fungus survives in the soil as hard black fungal bodies called sclerotia. Under prolonged moist soil conditions, the sclerotia germinate and produce mushroom-like structures called apothecia which release ascospores into the air. The spores infect canola by landing on flower petals. The dead petals fall off, and those adhering to leaves and stems provide opportunity and nutrition for the fungal spores to germinate, grow, and enter the plant. Spores cannot infect the leaves and stems directly.

Scierotinia stem rot is characterized by bleached and sometimes shredded stems or plants. When infected stems are split open, small black sclerotia usually can be found in the rotted tissue. The only effective control measure for Sclerotinia is a minimum 4- to 5-year rotation to non-susceptible crops such as cereals and grasses, along with control of broadleaved weeds that may also be susceptible.

The fungus causing blackleg of canola occurs as either a weakly virulent (mild) or a virulent (aggressive) strain. The virulent strain causes girdling stem cankers, and early infection can cause premature dying and lodging, resulting in high yield losses. The mild strain usually infects plants late in the season and rarely causes significant yield loss. The virulent strain of the blackleg fungus is widespread in Canada and was first detected in North Dakota in 1991.

The canola blackleg fungus can be seedborne, or the crop can be infected by airborne spores or blowing residue from neighboring fields. To avoid introducing blackleg into new areas, use certified seed and treat seed with Benlate fungicide. Where blackleg is already present, the fungus can persist on infected stubble or crop residue for several years. Follow a minimum 4-year crop rotation, control weed hosts (such as wild mustard), and bury canola residue by deep tillage.

All currently available Polish (*B. rapa*) canola varieties are susceptible to blackleg. Many Argentine (*B. napus*) varieties are moderately susceptible and a few are moderately resistant. Select less susceptible varieties for areas where blackleg is known to occur.

Insects

Flea beetles can be an early season pest of canola. Adults of these tiny black beetles chew shot-holes in cotyledons and early leaves. Inspect newly emerged fields daily, as damage can occur quickly. Plant early and fertilize adequately to aid plants in outgrowing beetle damage. If 25-30% defoliation occurs, spray with Sevin XLR at 1-2 pints/A or malathion at 2 pints/A.

Harvesting

Check canola fields often as they near maturity. Delayed harvest may lead to high field loss due to shattering. Seed color is more important than overall color of the field in determining plant maturity.

Swathing is recommended when about 30 to 40% of seeds on the main stem have turned or begun to turn from green to brown or yellow and when you can roll the seed between your fingers without squashing it. Seed moisture content should be about 30 to 35%.

Seeds formed in pods on the bottom third of the main stem will change color first. Examine plants from different parts of the field, taking into account low-lying areas, variable soil type, and areas of early ripening.

If a large acreage of canola is grown, begin swathing before the crop reaches the optimum color change stage. Once filled, seeds lose moisture rapidly. If swathing is begun at the optimum stage, part of the crop will likely be too ripe by the time swathing is finished. Argentine canola varieties can be swathed at 10 to 15% color change without loss of yield. Polish varieties should be left until 20 to 25% of the seed has changed color.

A small-grain swather and combine can be used for canola. Match reel speed to the forward speed on the swather, so the reel just lays the cut material gently back on the table without shattering. Canola forms a fluffy windrow, so leave stubble as high as possible to reduce blowing of swaths by wind.

Polish canola that is uniformly mature and free of green weeds may be straight-combined without swathing. Straight-combining is not recommended for Argentine canola because of excessive seed loss due to shattering when the crop is mature.

Swathed canola is ready to combine when the seed moisture drops to around 10% and most seeds are no longer green. Reduce cylinder speed to one half to two thirds that used for wheat to avoid breaking up the stems, overloading the sieves, and cracking the seeds.

Seed Storage

Canola seed is small and round and flows easily. Combines, truck boxes, and storage bins must be very tight.

For long-term storage the seed must be at no more than 8 to 9% moisture and kept at temperatures below 68 F. The seed may 'sweat" for up to 6 weeks after harvest, even at 8-10% moisture, so check for heating and spoilage at regular intervals.

Canola may be cooled and/or dried to safe moisture and temperature levels for storage using aeration, natural air drying, heated air drying, or a combination of these methods. Care must be taken to ensure adequate air flow and prevent heat damage and spoilage.

Grading and Marketing

U.S. Grain Inspection Service standards for grading canola and rapeseed are based primarily on admixtures and soundness. Seed containing foreign material, wild or tame mustard seed, soil, sclerotia, or stones is downgraded. Seed soundness is based on broken seed, heat damage, odor, and seed that is green after cracking.

Most canola is grown under contract. If contracts specify a production level, they should contain an "Act of God" clause, or the grower should carry sufficient crop insurance to cover the specified production in case of crop loss to hail, flood, drought, or frost.

Other Sources of Information

Canola Growers Manual. Published by the Canola Council of Canada. 400-167 Lombard Ave., Winnipeg, Manitoba R3B0T6, Canada. This is an excellent comprehensive guide on all aspects of canola production. It is published in loose-leaf format, with periodic free updates. It is also available online at The Canola Connection website (see below). Its pesticide information may not apply to South Dakota canola production, as product labeling differs between the U.S. and Canada.

Canola Production. D.R. Berglund and K. McKay. NDSU Extension Service publication A-686 (Revised), North Dakota State University, Fargo, ND.

The Canola Connection website
http ://www.canola-council.org/
Maintained by the Canola Council of Canada. This website provides online access to the Canola Growers Manual, as well as links to other canola publications, markets, businesses, people, and information.

NDSU Langdon Research Extension Center website
http://www.ag.ndsu.nodak.edu/langdon/
This website provides results from the 1997 and 1998 North Central U.S. Canola Variety Trials conducted in North Dakota, South Dakota, Minnesota, and Wisconsin, in addition to North Dakota variety performance information on various crops.

This publication and others can be accessed electronically from the SDSU College of Agriculture & Biological Sciences publications page, which is at http://agbiopubs.sdstate.edu/articles/ExEx8130.pdf

ExEx 8130- pdf by CES. February 2000; updated April 2002.

Table 1. Seed yield and % oil for canola varieties grown in South Dakota, 1997-1999.

			Seed Yield (lbs/A)							
			Watertown			Webster			% Oil	
Variety	Company/Brand	Type*	1997	1998	1999	1997	1998	1999	1997	1999
B. napus (Argentine) varieties:									-2-	-2-
179165	Agriprogress	OP	--	1665	--	--	1358	--	--	--
1-9173	Agriprogress	OP	--	2196	--	--	1459	--	--	--
45A51	Pioneer	OP-RR	--	--	1521	--	--	1709	--	37.6
Arrow RR	Interstate Seed Co.	OP-RR	--	--	1795	--	--	1336	--	35.1
Battleford	IntegraSeed Ltd.	OP	--	--	1447	--	--	1361	--	36.7
BNS 94043	Brett-Young Seeds	OP	1699	--	--	1898	--	--	41.3	--
CL2078	Croplan Genetics	SYN	--	--	1143	--	--	1876	--	36.5
Crusher	Interstate Seed Co.	OP	1760	2191	1158	2177	1822	1768	40.1	36.8
D1-9124	Agriprogress Inc.	OP	1468	--	--	1624	--	--	41.3	--
Dakini	Agriprogress Inc.	OP	1745	--	--	1753	--	--	42.7	--
Eagle	IntegraSeed Ltd.	OP	--	--	1629	--	--	1354	--	35.8
Ebony	Limagrain Genetics	OP	1747	--	1267	1120	--	1665	40.4	37.5
GOH 18	Brett-Young Seeds	OP	1896	--	--	2037	--	--	40.5	--
HCN 41	AgrEvo Canada	OP-LL	--	--	1409	--	--	1291	--	35.8
HN 9466	Hungnong Seed Amer.	OP	1857	--	--	2150	--	--	40.8	--
HN 9611	Hungnong Seed Amer.	OP	1617	--	--	1782	--	--	39.8	--
HN 9616	Hungnong Seed Amer.	OP	1407	--	--	1543	--	--	39.2	--
HN 9620	Hungnong Seed Amer.	OP	1593	--	--	1806	--	--	39.3	--
Hudson	Croplan Genetics	OP	--	--	1989	--	--	1292	--	37.2
Hyola 308	Interstate Seed Co.	H	1166	--	--	1599	--	--	40.4	--
Hyola 330	Interstate Seed Co.	H	--	--	2199	--	--	1579	--	37.4
Hyola 357 RR	Interstate Seed Co.	H-RR	--	--	2258	--	--	1499	--	37.9
Hyola 401	Interstate Seed Co.	H	1377	2518	2189	1646	1148	1992	37.9	36.7
Hyola 420	Interstate Seed Co.	H	--	2472	1383	--	1627	2105	--	37.4
Impulse	Interstate Seed Co.	OP	1760	--	--	1930	--	--	39.4	--
InVigor 2373	AgrEvo Canada	H-LL	--	--	1854	--	--	1946	--	37.5
Kaystar KC-701	Kaystar Seed	H	--	--	1360	--	--	1696	--	37.9
LG 3235	Limagrain Canada	OP-RR	--	--	1294	--	--	1069	--	37.6
LG 3260	Limagrain Genetics	OP	1727	--	--	1801	--	--	40.3	--
LG 3275	Limagrain Canada	OP-RR	--	--	1213	--	--	968	--	36.5
LG 3310	Limagrain Genetics	OP	1693	--	--	1661	--	--	41.2	--
LG 3333	Limagrain Canada	OP	--	1584	1192	--	1184	1165	--	37.5
LG 3345	Limagrain Canada	OP-RR	--	--	1307	--	--	1002	--	38.5
LG 3369	Limagrain Canada	OP	--	1923	1034	--	1426	1118	--	38.6
LG3295	Limagrain Canada	OP-RR	--	--	1782	--	--	1165	--	36.4
OAC Dynamite	Interstate Seed Co.	OP	1541	--	--	1711	--	--	40.3	--
OAC Summit	Agri-Tel Grain Ltd.	OP	--	1977	1196	--	1327	881	--	35.7
Optimum 500	Interstate Seed Co.	OP	1674	--	--	1934	--	--	41.5	--
Phoenix	AgrEvo Canada	OP-LL	--	--	1341	--	--	1065	--	38.0
PHS 98-596	AgrEvo Canada	H-LL	--	--	1041	--	--	1718	--	38.8
PHS 98-601	AgrEvo Canada	H-LL	--	--	1634	--	--	1551	--	39.0
PHS 98-639	AgrEvo Canada	H-LL	--	--	1622	--	--	1517	--	35.8
PHS 98-685	AgrEvo Canada	H-LL	--	--	1650	--	--	1705	--	36.3
PHS 98-730	AgrEvo Canada	H-LL	--	--	1862	--	--	1302	--	36.2

Table 1. Seed yield and % oil for canola varieties grown in South Dakota, 1997-1999.

Variety	Company/Brand	Type*	Seed Yield (lbs/A)						% Oil	
			Watertown			Webster				
			1997	1998	1999	1997	1998	1999	1997	1999
B. napus (Argentine) varieties:									-2-	-2-
PR 5292	Limagrain Canada	OP-RR	--	--	1372	--	--	1121	--	37.6
PR 5296	Limagrain Canada	OP-RR	--	--	1560	--	--	1559	--	37.2
PSL 95-110	Parsons Seeds Ltd.	OP	1374	--	--	1519	--	--	39.4	--
PSL 95-116	Parsons Seeds Ltd.	OP	2090	1931	--	1995	1764	--	42.6	--
PSL 97-102	Parsons Seeds Ltd.	OP	--	1737	--	--	1810	--	--	--
PSL 98-112	Parsons Seeds Ltd.	OP	--	--	1384	--	--	908	--	36.8
Q2	Interstate Seed Co.	OP	--	--	1883	--	--	1641	--	35.7
Quantum	Interstate Seed Co.	OP	--	2079	--	--	1150	--	--	--
Quest	Interstate Seed Co.	OP-RR	--	--	1684	--	--	1214	--	37.4
Sponsor	Svalof Weibull Ltd.	OP	1696	--	--	2003	--	--	39.6	--
SW RideR	Interstate Seed Co.	SYN-RR	--	--	1784	--	--	1404	--	36.5
Trailblazer	Northstar Seed Ltd.	OP	1707	--	--	1659	--	--	41.9	--
X 710	Limagrain Genetics	OP	1597	--	--	1560	--	--	41.2	--
X 801	Limagrain Genetics	OP	1690	--	--	1846	--	--	40.8	--
Z009	Interstate Seed Co.	OP	--	--	1870	--	--	1504	--	36.6
B. rapa (Polish) varieties:										
AC Boreal	Ag Canada	OP	1143	1441	860	1312	509	382	43.2	36.8
AC Parkland	Ag Canada	OP	1148	1478	642	1528	555	422	41.7	36.4
Reward	Ag Canada	OP	1189	1549	844	1366	620	470	42.9	36.3
Tobin	Ag Canada	OP	1162	--	--	1378	--	--	40.4	--
Mean			1575	1910	1491	1716	1268	1350	40.7	37.0
LSD .05			285	323	442	314	307	276		
C.V.			12.7	11.8	21.2	11.2	16.4	14.6		

* OP=Open Pollinated, H=Hybrid, SYN=Synthetic, RR=Roundup Ready, LL=Liberty Link.

Table 1. (Cont.) Flowering, maturity, height, lodging and shattering data for canola varieties, 1997-1999.

Variety	Days to 10% Flwr			Days to Maturity			Plant Height (in.)			Lodging (1-9)**			Shattering (%)		
	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999
	-2-*	-2-	-1-	-2-	-1-	-2-	-2-	-2-	-2-	-2-	-2-	-2-	-2-	-1-	-2-
B. napus (Argentine) varieties:															
179165	--	49	--	--	94	--	--	42	--	--	1.6	--	--	10	--
1-9173	--	51	--	--	98	--	--	46	--	--	2.9	--	--	2	--
45A51	--	--	54	--	--	101	--	--	53	--	--	1.6	--	--	2
Arrow RR	--	--	51	--	--	97	--	--	49	--	--	4.5	--	--	11
Battleford	--	--	50	--	--	100	--	--	49	--	--	1.9	--	--	4
BNS 94043	50	--	--	102	--	--	37	--	--	2.7	--	--	1	--	--
CL2078	--	--	54	--	--	102	--	--	53	--	--	2.5	--	--	17
Crusher	52	57	57	104	103	103	39	50	54	1.6	1.4	1.0	4	0	14
D1-9124	48	--	--	103	--	--	35	--	--	4.9	--	--	2	--	--
Dakini	54	--	--	112	--	--	43	--	--	4.7	--	--	5	--	--
Eagle	--	--	50	--	--	99	--	--	48	--	--	1.5	--	--	3
Ebony	51	--	56	105	--	103	35	--	53	1.9	--	4.6	6	--	6
GOH 18	50	--	--	104	--	--	40	--	--	3.1	--	--	4	--	--
HCN 41	--	--	54	--	--	102	--	--	50	--	--	1.8	--	--	0
HN 9466	50	--	--	103	--	--	40	--	--	2.0	--	--	4	--	--
HN 9611	50	--	--	105	--	--	38	--	--	2.7	--	--	10	--	--
HN 9616	48	--	--	100	--	--	36	--	--	3.0	--	--	2	--	--
HN 9620	47	--	--	99	--	--	36	--	--	3.6	--	--	3	--	--
Hudson	--	--	45	--	--	95	--	--	49	--	--	2.8	--	--	19
Hyola 308	45	--	--	92	--	--	27	--	--	2.1	--	--	0	--	--
Hyola 330	--	--	45	--	--	97	--	--	46	--	--	3.4	--	--	5
Hyola 357 RR	--	--	46	--	--	97	--	--	43	--	--	1.4	--	--	8
Hyola 401	47	47	48	97	98	100	29	39	46	2.4	2.7	2.1	1	0	2
Hyola 420	--	48	50	--	99	101	--	43	51	--	2.4	4.6	--	0	6
Impulse	51	--	--	104	--	--	36	--	--	3.6	--	--	1	--	--
InVigor 2373	--	--	53	--	--	102	--	--	53	--	--	2.5	--	--	3
Kaystar KC-701	--	--	53	--	--	102	--	--	53	--	--	2.0	--	--	9
LG 3235	--	--	48	--	--	98	--	--	47	--	--	2.3	--	--	16
LG 3260	47	--	--	100	--	--	30	--	--	3.1	--	--	2	--	--
LG 3275	--	--	48	--	--	98	--	--	47	--	--	1.1	--	--	7
LG 3310	50	--	--	104	--	--	34	--	--	2.6	--	--	7	--	--
LG 3333	--	47	48	--	96	101	--	43	49	--	3.1	3.0	--	5	10
LG 3345	--	--	50	--	--	100	--	--	50	--	--	3.1	--	--	5
LG 3369	--	51	52	--	102	101	--	47	52	--	2.0	1.5	--	1	8
LG3295	--	--	53	--	--	100	--	--	53	--	--	5.0	--	--	6
OAC Dynamite	49	--	--	100	--	--	33	--	--	3.0	--	--	1	--	--
OAC Summit	--	53	53	--	102	102	--	48	54	--	3.0	3.5	--	0	2
Optimum 500	50	--	--	104	--	--	37	--	--	3.4	--	--	1	--	--
Phoenix	--	--	53	--	--	101	--	--	51	--	--	4.1	--	--	1
PHS 98-596	--	--	53	--	--	102	--	--	54	--	--	4.5	--	--	21
PHS 98-601	--	--	54	--	--	102	--	--	57	--	--	4.1	--	--	1
PHS 98-639	--	--	54	--	--	102	--	--	57	--	--	3.9	--	--	1
PHS 98-685	--	--	52	--	--	101	--	--	54	--	--	2.9	--	--	2
PHS 98-730	--	--	50	--	--	98	--	--	53	--	--	5.6	--	--	2

Table 1. (Cont.) Flowering, maturity, height, lodging and shattering data for canola varieties, 1997-1999.

Variety	Days to 10% Flwr			Days to Maturity			Plant Height (in.)			Lodging (1-9)**			Shattering (%)		
	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999	1997	1998	1999
	-2-*	-2-	-1-	-2-	-1-	-2-	-2-	-2-	-2-	-2-	-2-	-2-	-2-	-1-	-2-
B. napus (Argentine) varieties:															
PR 5292	--	--	50	--	--	99	--	--	50	--	--	3.5	--	--	6
PR 5296	--	--	50	--	--	99	--	--	52	--	--	2.8	--	--	4
PSL 95-110	49	--	--	99	--	--	33	--	--	3.3	--	--	1	--	--
PSL 95-116	51	52	--	105	103	--	35	48	--	2.7	2.0	--	1	0	--
PSL 97-102	--	52	--	--	102	--	--	46	--	--	2.7	--	--	0	--
PSL 98-112	--	--	52	--	--	101	--	--	54	--	--	3.1	--	--	2
Q2	--	--	54	--	--	100	--	--	51	--	--	3.0	--	--	2
Quantum	--	50	--	--	99	--	--	46	--	--	3.1	--	--	1	--
Quest	--	--	50	--	--	99	--	--	50	--	--	2.1	--	--	8
Sponsor	52	--	--	104	--	--	40	--	--	1.9	--	--	1	--	--
SW RideR	--	--	50	--	--	99	--	--	51	--	--	2.0	--	--	21
Trailblazer	49	--	--	101	--	--	35	--	--	2.6	--	--	0	--	--
X 710	49	--	--	102	--	--	34	--	--	2.7	--	--	8	--	--
X 801	50	--	--	102	--	--	37	--	--	2.9	--	--	4	--	--
Z009	--	--	53	--	--	101	--	--	52	--	--	4.6	--	--	3
B. rapa (Polish) varieties:															
AC Boreal	41	39	39	84	81	85	27	40	42	2.3	3.8	3.8	0	0	0
AC Parkland	42	41	40	85	84	85	29	43	44	2.0	3.2	3.5	0	0	0
Reward	41	40	40	85	83	86	26	39	44	2.4	2.4	4.1	0	0	0
Tobin	42	--	--	83	--	--	26	--	--	2.0	--	--	0	--	--
Mean	48	48	50	100	96	99	34	44	51	2.8	2.6	3.0	2	1.3	6
LSD .05	1		1	3	2	2	4		4	0.9		2.3	4		ns
C.V.	1.6		1.4	2.5	1.27	1.6	10.0		6.8	32.0		52.2	159.3		156.5

* Indicates number of locations averaged to obtain the means in that column.

** Lodging was rated on a scale of 1 to 9, where 1 = no lodging and 9 = prostrate on ground.